**Cc:** Porter, Andrea[porter.andrea@epa.gov]; Bosscher, Valerie[bosscher.valerie@epa.gov]
**To:** Biedrzycki, Paul[PBIEDR@milwaukee.gov]
**From:** Deltoral, Miguel
**Sent:** Tue 4/11/2017 12:59:43 PM
**Subject:** Re: Question from Paul B. In Milwaukee

Hi Paul,

At this point in time, I am not sure I see liners having any advantage over full LSL replacement and there are limitations/drawbacks that give me pause in recommending them. I am copying a couple of our engineers to see if they have any additional thoughts/feedback.

**Pros**

- Anything that provides a barrier to keep lead from contacting the water is a good thing.
- There may be instances where excavation may not be possible or unsafe to do, in which case a liner would be better than doing nothing.

**Cons**

- The LCR requires LSL replacement, so if a system is triggered into replacement, there is no provision allowing for lining the LSLs in lieu of LSL replacement.
- I am not sure there would be any significant savings using liners as compared to fully removing the LSL. Both would require personnel, excavation and equipment which are the largest cost components.
- For lining, the pipes would need to be cleaned out, especially if any portion is galvanized iron pipe, so the amount of time to clean/flush the pipes, set the epoxy and wait until it cures (16-24 hours) would likely be much greater than running new copper pipe and either the homeowner will not have water or they would need a temporary connection installed. Companies are working on trying to get the work done same day, but they are not there yet.
- Galvanized iron pipe connected to lead pipe is likely very old and the remaining useful life of the pipe needs to be considered, since replacing the pipe after the liners are installed would approximately double the final cost, long-term.
- LSLs are often curved and galvanized iron pipe can be severely corroded, so cleaning may be difficult or impossible.
- I am not sure if all companies do, but some charge a licensing fee to use the lining technology which would increase the cost of the lining option.
- Attempts to install liners through the external shut-off valve have caused problems with valve operation and lead release, so a pit at the main and a pit at the external shut-off would likely still need to be excavated, similar to trenchless LSL replacement.
- Full replacement of LSLs provides a permanent solution while liners leave questions

regarding the long-term effectiveness/durability of the liners.
- There are big differences in the expected service life and warranties for the liners.

Miguel A. Del Toral
Regulations Manager
U.S. EPA R5 GWDWB
77 West Jackson Blvd, (WG-15J)
Chicago, IL 60604
Phone: (312) 886-5253

---

**From:** Biedrzycki, Paul <PBIEDR@milwaukee.gov>
**Sent:** Monday, April 10, 2017 08:34 PM
**To:** Deltoral, Miguel
**Subject:** Question from Paul B. In Milwaukee

Hi Miguel -

Can you share with me your perspectives/thoughts on the use of LSL liners and coatings as a cost-effective measure to reduce lead in drinking water in residential settings? Pros and cons would be appreciated.

Thanks!

Paul b.

Sent from my iPad

Paul A. Biedrzycki, MPH, MBA, CIH

Director, Disease Control and Environmental Health

City of Milwaukee Health Department

841 N. Broadway, 3rd Floor

Milwaukee, WI 53202

pbiedr@milwaukee.gov

414-286-5787

Adjunct Faculty

Zilber School of Public Health

University of Wisconsin – Milwaukee